

REMARKS

Claims 1-32 are pending. Claims 1-3 and 24-32 are currently under examination, claims 4-23 having been withdrawn as the result of the March 12, 2009 Restriction Requirement. Applicants note that claims 31 and 32 depend from withdrawn claim 4.

The Office Action rejects claims 1-3, 24-26, 28 and 29 under 35 U.S.C. §102(b) over WO/0138240 to Quenzer et al.; rejects claim 30 under 35 U.S.C. §102(b) or in the alternative under 35 U.S.C. §103(a) over Quenzer; rejects claim 27 under 35 U.S.C. §103(a) over Quenzer in view of U.S. Patent Application Publication No. 2003/0020399 to Moller et al.; rejects claim 31 under 35 U.S.C. §103(a) over Quenzer in view of U.S. Patent Application Publication No. 2002/0130986 to Richard; and rejects claim 32 under 35 U.S.C. §103(a) over Quenzer, Richard and further in view of Moller. These rejections are respectfully traversed.

Applicants' independent claim 1 is directed to a method for producing single microlenses or an array of microlenses composed of a glass type material. The method comprises providing a first substrate with a surface containing impressions over which a second substrate composed of a glass type material is placed at least partially overlapping it and is joined therewith under vacuum conditions. The substrate composite is tempered in such a manner that the second substrate softens and flows into the impressions of the first substrate, thereby structuring the side of the second substrate facing away from the first substrate in order to form at least one microlens surface. For forming each microlens surface, the soft and glass type material the second substrate flows into at least two impressions of the first

substrate, the shape size and arrangements of the two impressions determine the curvature of the microlens surface.

Such features encompass Applicants' exemplary embodiment as illustrated in Fig. 1 wherein impressions 1 are placed in the surface of a silicon wafer. Each single impression being delimited by an adjacent impression by a narrow intermediate fillet 2. A glass wafer 4 composed of pyrex glass or Borofloat glass® under vacuum conditions is bonded to the surface 3 of the silicon wafer. The upper side 5 of the glass wafer 4, facing away from the silicon wafer, is joined with another silicon wafer. The silicon wafer has a recess 6 which is matched to the arrangement of the impressions 1 inside the silicon wafer. In a tempering process the glass wafer 4 softens and flows into the cavities determined by the impressions 1. The shape, size and arrangement of the cavities in the silicon wafer can selectively set the amount of glass that flows into the cavities. This permits the production of microlenses having defined concave shape surface curvatures with a very high degree of reproducibility.

In contrast, the Quenzer reference, which has inventors in common with the instant application and is also cited therein, does not disclose these features. Instead, the Quenzer publication discloses a method for producing single microlenses or an array of microlenses in which the shape and size of each single microlens depends on one single recess within a structured semiconductor substrate into which molten glass material is displaced. Thus, the Quenzer publication's disclosure does not provide the ability to produce lenses in the controlled manner of Applicants' independent claim 1. In Applicants' independent claim 1 each microlens surface is formed using at least two impressions of the first substrate.

Fig. 3 of the Quenzer patent discloses an embodiment for producing two separate microlenses each of which is formed by floating molten glass material into one single recess. The use of more than one recess for forming a single microlens surface is not disclosed or suggested by the Quenzer publication.

The dependent claims are allowable for at least the reasons discussed above as well as for the individual features they recite. For example, dependent claim 3 recites wherein the first substrate contains at least two impressions separated by intermediate fillet area over which a convex surface contour forms at the microlens surface opposite the first substrate due to the lateral flowing off of the softened material and to the at least two impressions during the tempering. This feature is not disclosed by the Quenzer publication.

The Moller and Richard publications do not overcome the deficiencies of the Quenzer publication noted above.

Prompt and favorable examination on the merits is respectfully requested. Should the Examiner have any questions regarding this Amendment or the application in general, he is invited to contact the undersigned at the number provided below.

Respectfully submitted,

BUCHANAN INGERSOLL & ROONEY PC



By:

Michael Britton
Registration No. 47260

Date: August 27, 2009

Customer No. 21839
703 836 6620